

Abstract of the Disclosure

Systems and methods of identifying molecules of polymers such as, for example, a nucleic acid, are described. The method involves centering a bias voltage across a pair of nano-electrodes separated by a channel that corresponds to one of any of the energy differences between any two internal energy levels of a molecule of interest, and modulating the bias voltage with a modulation waveform while the molecule of interest is in the channel. An electrical signal characteristic of the molecule of interest is derived from the tunneling current between the nano-electrodes, and the characteristic electrical signal is compared with known values of the signal for chemically-known molecules in order to identify the molecule of interest. Multiple pairs of nano-electrodes may be employed to identify more reliably a single molecule or multiple molecules.